

## MISCELLANEOUS NOTES ON THE GENUS SPHAGNUM. 6

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This paper includes descriptions and illustrations of eight new species of *Sphagnum*, one from the United States and eight from South America. The *Sphagna* of South America are surprisingly numerous, and as I continue to add new species, particularly from Brazil, I hope that many old ones and not too many new ones will fall into synonymy!

***Sphagnum*** [sect. *Sphagnum*] ***cundinamarcanum*** Crum, sp. nov. Fig. 1.

Plantae aliquanto robustae, pallido-luteae. Caules fusci; parietes externi cellularum superficialium epidermidis stratis 3–4; cellulae epidermidis efibrillosae, 1–2-porosae. Folia caulina 1.7–1.9 mm longa, lingulata, margine fibrillosa; cellulae hyalinae non septatae, superficie exteriori poris 11–14 ellipticis commissuralibus et terminalibus, apice cucullato lacunis membranaceis magnis instructae, interiore poris nullis. Fasciculi ramorum ramis 3 (2 patentibus); cellulae epidermidis fibrillosae, 1-porosae. Folia ramulina 1.8–2 mm longa, concava, ovalia, marginibus sulco resorptorio; cellulae hyalinae superficie exteriori 5–7 poris ad commissuras dispositis et ternis in angulis cellularum conjunctis, ad margines foliorum poris numerosis (10–14) ad commissuras, interiore superficie poris nullis; cellulae chlorophylliferae sectione transversali utrinque inclusae.

Plants fairly robust, 8–10 cm high, pale yellowish. Stems brown; cortex 3–4-layered, the epidermal cells elongate, efibrillose, 1–2-porose. Stem leaves 1.7–1.9 mm long, lingulate, cucullate, fringed at margins; hyaline cells fibrillose in the upper 1/2 or more, not divided, on the outer surface with 11–14 rounded, thin-margined pores at commissures and angles, with membrane gaps at the cucullate apex, on the inner surface without pores. Branches in fascicles of 3 (2 spreading); cortex fibrillose, 1-porose. Branch leaves 1.8–2 mm long, broadly oval, deeply concave, bordered by a resorption furrow; hyaline cells on the outer surface with membrane gaps at the leaf apex and relatively small, elliptic pores in 3's at adjacent angles in addition to 3–4 at the commissures and at the margins with more numerous commissural pores (10–14), on the inner surface without pores; green cells in section central and included, the hyaline cells somewhat convex on both surfaces.

COLOMBIA. Cundinamarca: Mpio. Aquitania, Páramo Cintas, carretera Aquitania–Pajarito, 3300 m, en pared de tierra expuesto, *Margarita Escobar Acosta & José Santa* 537, 29 July 1985 (type, NY).

Striking features include the stem leaves with fringed margins but otherwise approaching branch leaves in having cucullate tips perforated by membrane gaps and numerous rounded commissural pores on the outer surface. The upper median hyaline cells of branch leaves have a few elliptic pores at commissures as well as triple pores at adjoining corners, while the marginal cells show as many as 14 commissural pores per cell.



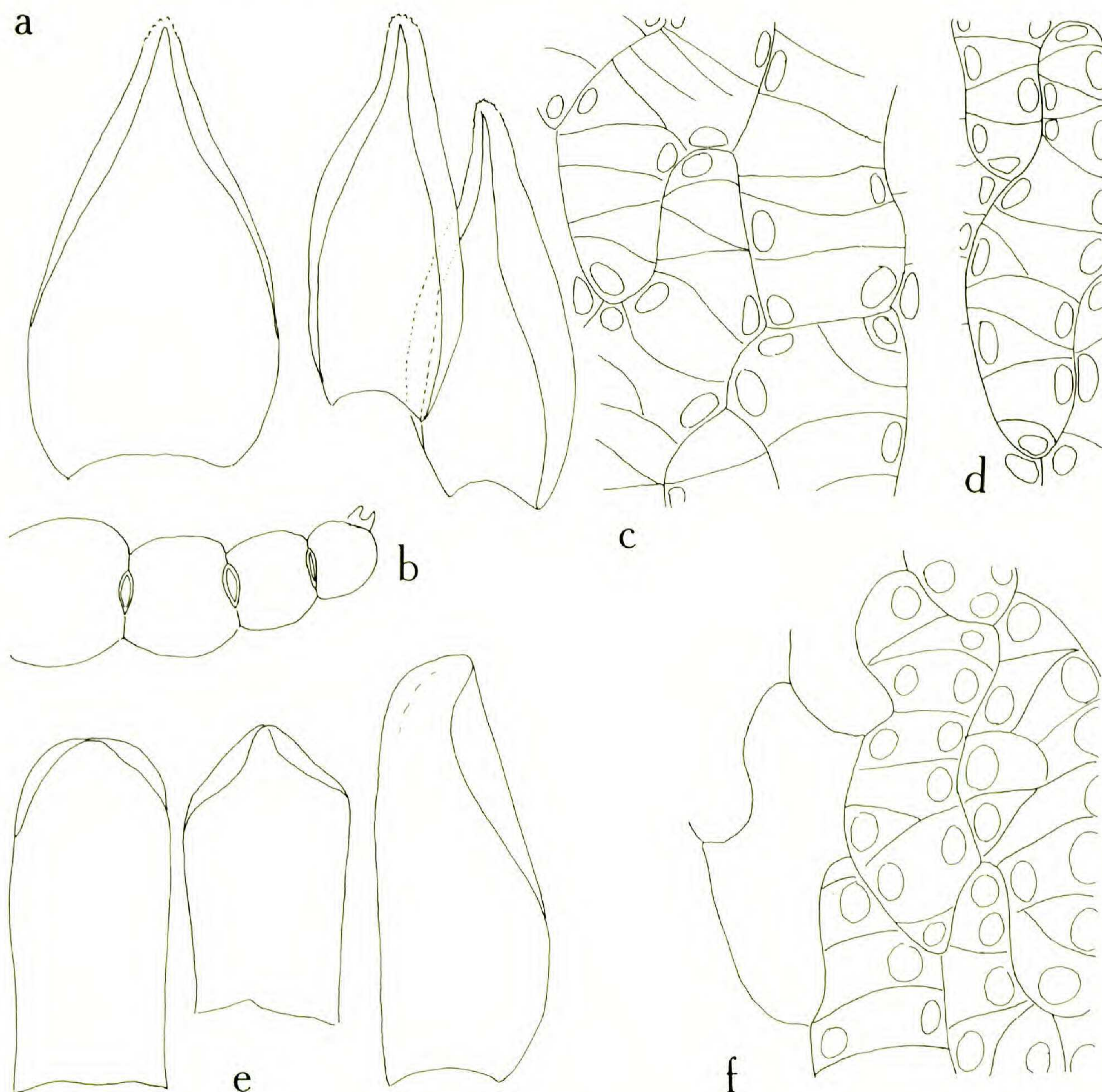


FIG. 1. *Sphagnum cundinamarcanum*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper median cells of branch leaf, outer surface,  $\times 400$ . d. Upper marginal cells of branch leaf, outer surface,  $\times 400$ . e. Stem leaves,  $\times 25$ . f. Upper cells of stem leaf, outer surface,  $\times 400$ .

***Sphagnum* [sect. *Sphagnum*] *frahmii* Crum, sp. nov.**

Fig. 2.

Plantae usque ad 12 cm altae, pallide virides vel fuscae. Hyalodermis caulis 4 stratis; cellulae epidermidis efibrillosae vel raro imperfecte fibrillosae; cylindrus lignosus obscure fusco-rubens vel niger. Folia caulina fusca, 1.1–1.3 mm longa, lingulata, apice rotundata,  $\pm$  plana; cellulae hyalinae non septatae, efibrillosae, supra medium foliorum utrinque plerumque resorptae. Rami 4-fasciculati; cellulae epidermidis efibrillosae vel infirme fibrillosae. Folia ramulina 1.8–2 mm longa, valde concava, apice cucullata, late ovata, marginibus sulco resorptorio instructis; cellulae hyalinae superficie exteriori poris ellipticis ternis in angulis conjunctis, interiore poris nullis; cellulae chlorophylliferae sectione transversali utrinque inclusae.

Plants up to 12 cm high, pale green to pale brown. Cortical cells of stem in 4 layers, 1(–2)-porose, efibrillose or occasional cells fibrillose; wood cylinder very dark red-brown, almost black. Stem leaves brown, 1.1–1.3 mm long, lingulate, rounded at the apex, plane or nearly so; hyaline cells not divided or fibrillose, largely resorbed on 1 or both surfaces in the upper half. Branches in fascicles of 4



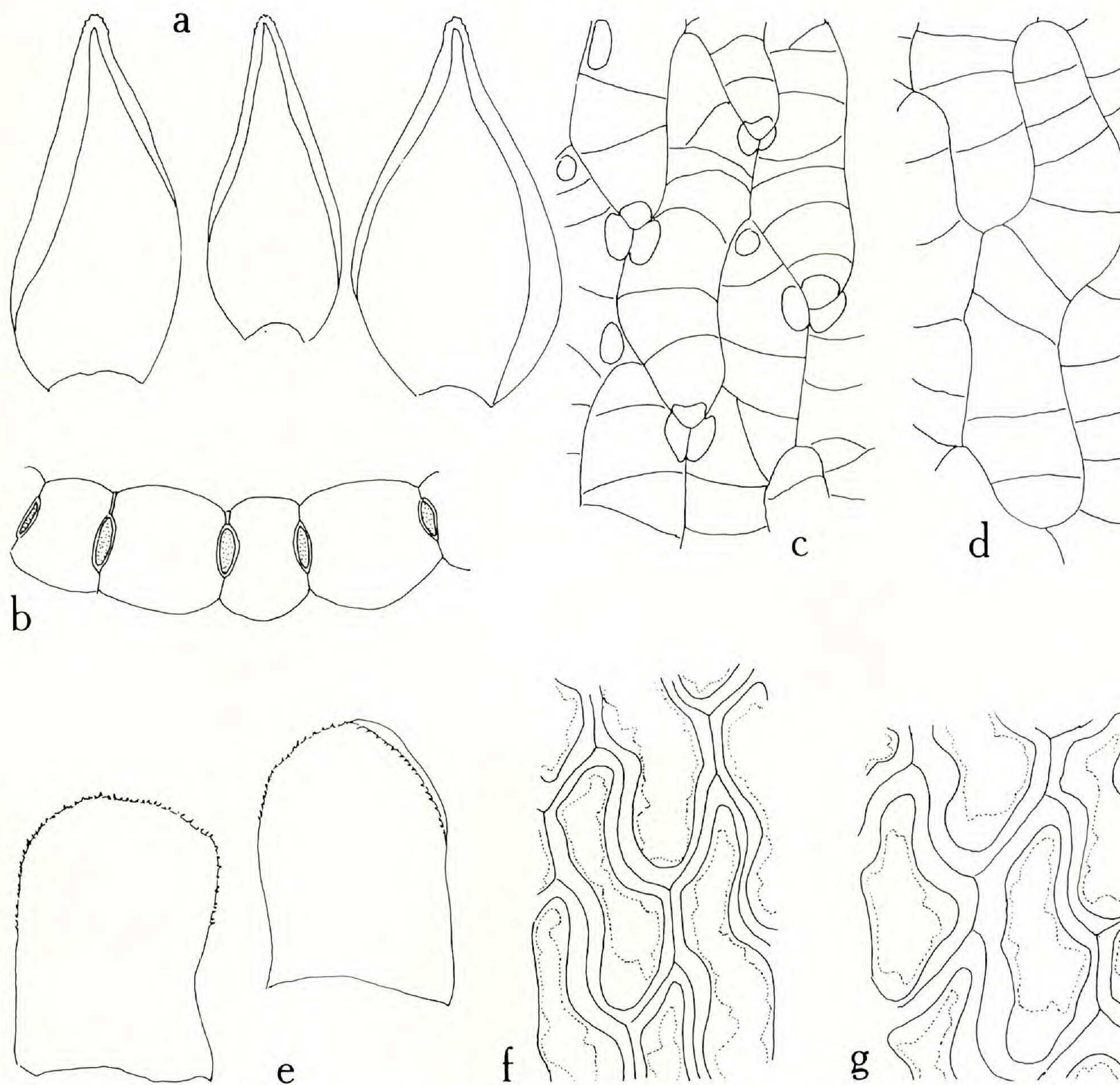


FIG. 2. *Sphagnum frahmii*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ . e. Stem leaves,  $\times 25$ . f. Upper cells of stem leaf, outer surface,  $\times 400$ . g. Upper cells of stem leaf, inner surface,  $\times 400$ .

(2 spreading); cortex efibrillose or some cells fibrillose. Branch leaves 1.8–2 mm long, deeply concave, broadly ovate, roughened at back of the apex and denticulate-bordered by a resorption furrow; hyaline cells on the outer surface with elliptic pores in 3's at adjacent angles, on the inner surface without pores; green cells in section central and entirely included or sometimes very narrowly exposed on the inner surface because of slightly thickened end walls, the hyaline cells somewhat convex on both surfaces, often somewhat more convex on the outer surface.

BRAZIL. São Paulo: an der Küstenstrasse SP55 zwischen Peruibe und Itahaem, feuchter Restingawald und anschliessende offene Sandflächen, ca. 5 m.s.m., *J.-P. Frahm* 1866, 1869, 1874 (type), 17 July 1977 (MICH, ALTA); Regenwaldhänge nordöstlich von Dantos an der Strasse nach Bertioğa, ca. 40–60 m.s.m., *Frahm* 1872, 1873, 1875, 18 July 1977 (MICH, ALTA).

This species somewhat resembles *S. magellanicum* Brid., particularly in sectional views of branch leaves, but it differs from that species in its occurrence at very low altitudes, brown coloration, essential absence of fibrils in the cortical cells of stems and branches, and efibrillose hyaline cells of stem leaves. The branch



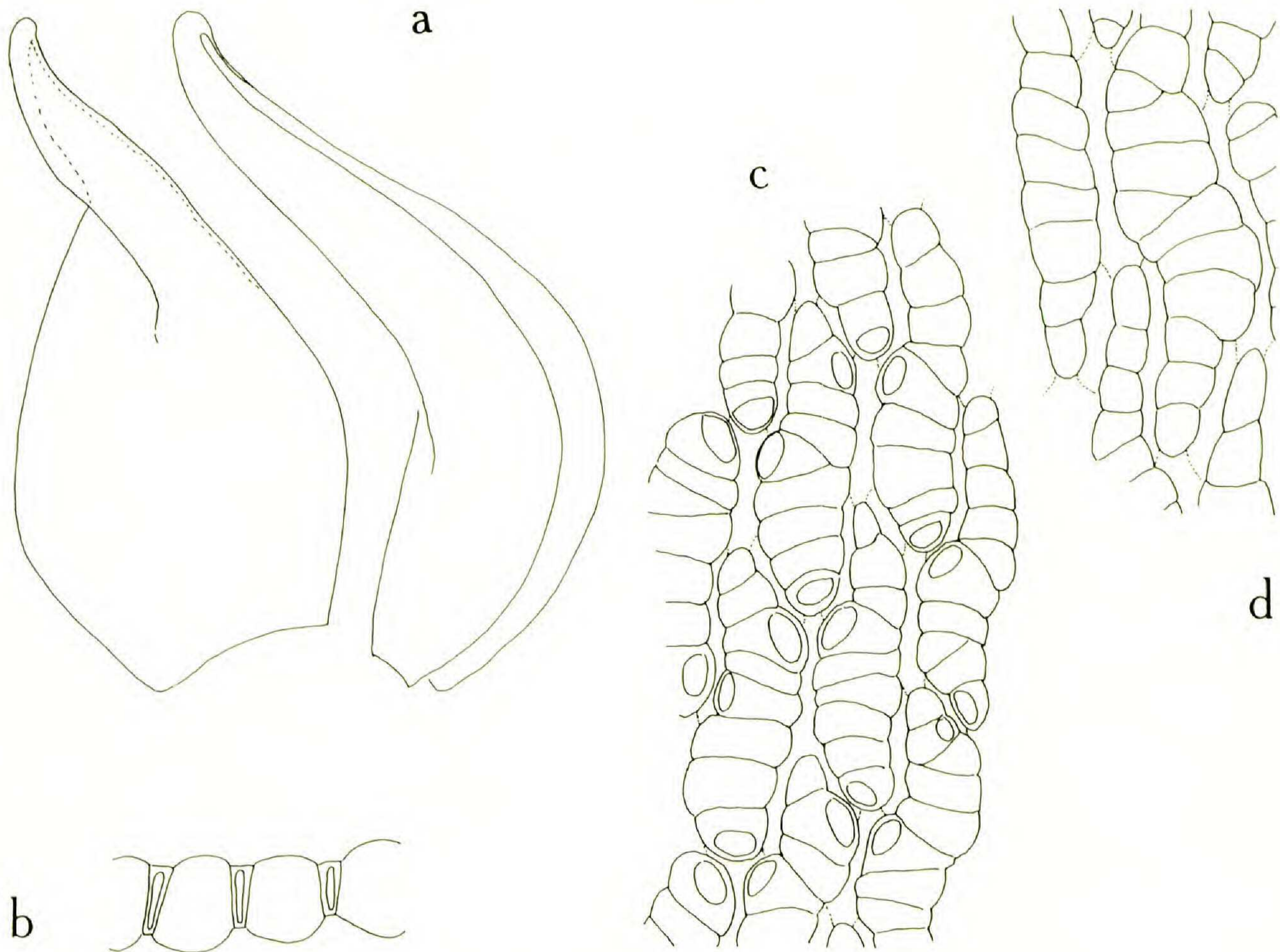


FIG. 3. *Sphagnum reclinatum*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ .

leaves have, for the most part, green cells central and entirely included, as in *S. magellanicum*, but some cells are very narrowly exposed on the inner surface.

***Sphagnum* [sect. *Sphagnum*] *reclinatum* Crum, sp. nov.**

Figs. 3, 4.

Plantae parvae (usque ad 4 cm altae), pallide virides. Caulis prostratus vel ascendens, irregulariter ramosus. Hyalodermis caulina 2 stratis, efibrillosa, raro 1-porosa; cylindrus lignosus luteo-fuscus. Folia caulina et ramulina similes. Folia caulina 2.5–3 mm longa, elongato-ovata, concava, apice cucullata, parte superiore late patentes, marginibus sulco resorptorio instructis; cellulae hyalinae utroque plerumque fibrillosae, superficie exteriori poris ternis in angulis conjunctis, interiore nullis vel paucis; cellulae chlorophylliferae trapezoideae, utrinque superficie folii liberae, pariete exteriori saepe  $\pm$  longiore.

Plants small (up to 4 cm long), pale green. Stems prostrate or ascending, irregularly branched, mostly on one side; cortical cells in 2 layers, efibrillose, rarely 1-porose; wood cylinder yellow-brown. Stem and branch leaves similar. Stem leaves 2.5–3 mm long, long-ovate, cucullate at the apex, concave, clasping at the base and wide-spreading to squarrose above whether wet or dry, bordered by a resorption furrow; hyaline cells fibrillose on both surfaces throughout, on the outer surface with elliptic pores commonly in 3's at adjacent angles, on the inner surface with pores none or very few; green cells trapezoidal, exposed somewhat more broadly on the inner surface, the hyaline cells somewhat convex on the inner surface, more broadly so on the outer. Branches single, often forked at the tip; cortex efibrillose and not or rarely uniporose. Branch leaves somewhat smaller (up to 2 mm long).





FIG. 4. *Sphagnum reclinatum*. Photograph by Wm. R. Buck.

VENEZUELA. Amazonas: Dpto. Río Negro, just outside Cañón Grande, along trail ca. 1.5–2 hours walk S of Neblina base camp to Río Agua Blanca, ca. 0°50'N, 66°10'W, low primary forest on white sand along white water river, *William R. Buck 12751*, February 1985 (MICH, holotype; NY, isotype).

Interesting characters of this species include the small size, prostrate growth, single branches produced only on the upper side of the stem, and stem and branch leaves clasping at base and wide-spreading at the tip and similar in shape and structure.

***Sphagnum* [sect. *Cuspidata*] *boyacanum* Crum, sp. nov.**

Fig. 5.

Plantae parvae, pallide fusco-luteae. Caulis pallidus; parietes externi cellularum superficialium epidermidis stratis duobus; cylindrus lignosus pallido-luteus. Folia caulina 1.7–1.8 mm longa, triangula, rotundo-obtusa, 3–4 seriebus cellularum limbata; cellulae hyalinae superne fibrillosae, superne raro septatae, medio usque ad basin foliorum saepe 1-septatae, superficie exteriori apice poris parvis, interiore poris nullis vel paucis in extremis cellularum. Fasciculi ramorum ramis 4 (2 patentibus). Folia ramulina ± secunda, in siccitate margine non undulata, 2–2.2 mm longa, oblongo-lanceolata, integra; cellulae hyalinae superficie exteriori poris 2–9 minutis, interiore poris nullis vel paucis, minutis; cellulae chlorophylliferae sectione transversali anguste triangulae, dorso liberae.

Plants small, pale yellow, brownish tinged above. Stems pale; cortex 2-layered; wood cylinder pale yellowish. Stem leaves 1.7–1.8 mm long, broadly oblong-triangular, rounded or rounded-obtuse at apex, bordered by 3–4 rows of linear cells; hyaline cells fibrillose in the upper half or more, occasionally 1-divided above, more commonly divided toward the leaf middle and in the lower half, on the outer surface with small apical pores, on the inner surface with pores none or with very small end pores. Branches in fascicles of 4 (2 spreading), short, curved,



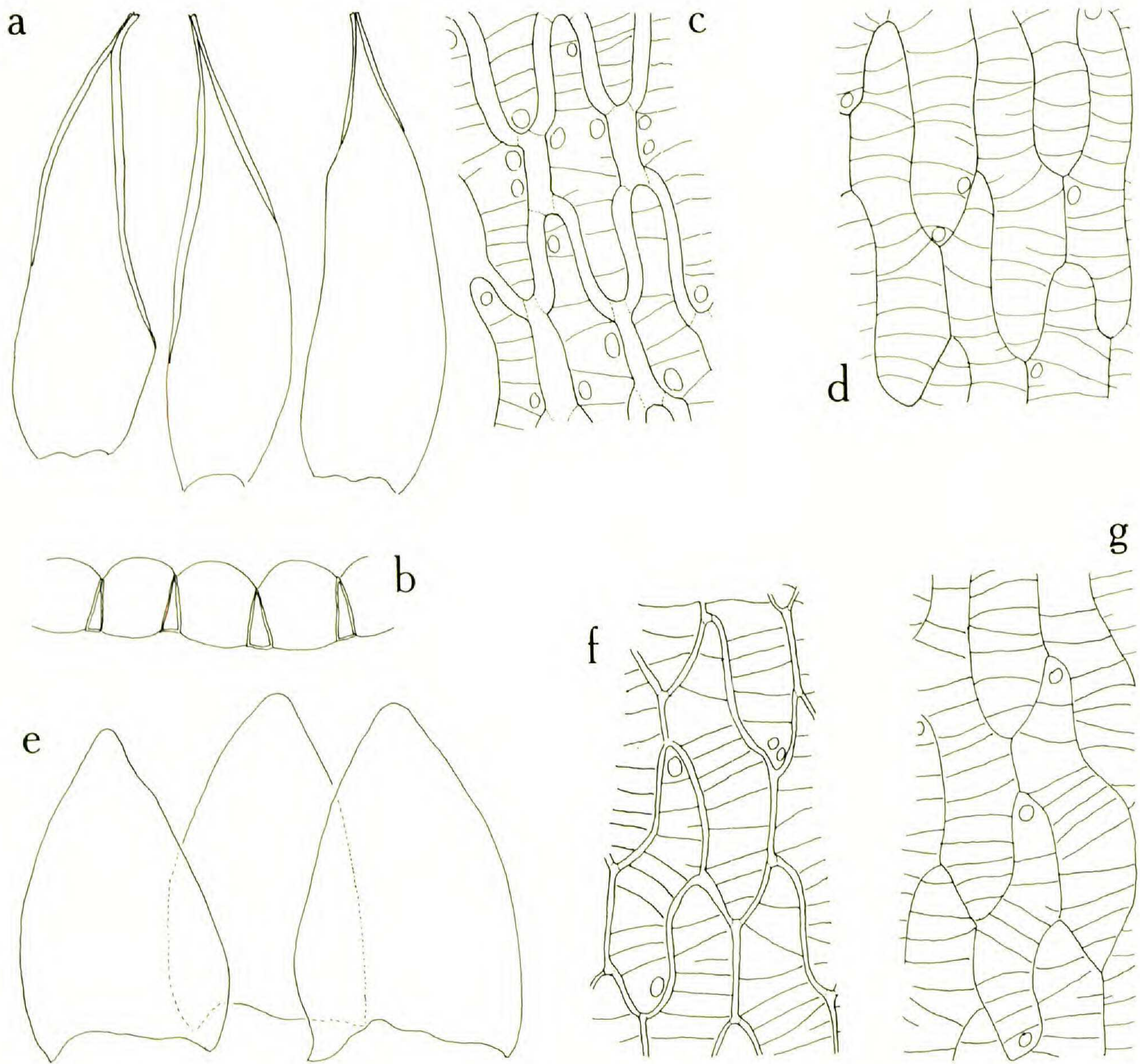


FIG. 5. *Sphagnum boyacanum*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ . e. Stem leaves,  $\times 25$ . f. Upper cells of stem leaf, outer surface,  $\times 400$ . g. Upper cells of stem leaf, inner surface,  $\times 400$ .

not particularly tapered. Branch leaves subfalcate-secund, not undulate-margined when dry, 2–2.2 mm long, oblong-lanceolate, entire; hyaline cells on the outer surface with 2–9 very small pores at ends, side corners, and commissures, on the inner surface with pores none or few, very small, in ends and side corners; green cells isosceles-triangular, exposed on the outer surface, the hyaline cells plane on the outer surface, moderately convex on the inner.

COLOMBIA. Boyaca: Dpto. Boyaca, Mpio. Chita, carretera Chita–Socha antes de llegar al Cardón, 3400 m, en el suelo pantanoso, *Margarita Escobar A. & José Santos* 497, 28 July 1985 (type, NY).

The plants have the weak appearance of *S. cuspidatum* Hoffm. and would seem to have been seasonally submerged. The curved branches and secund leaves have hyaline cells with few to numerous, very small pores at ends, side corners, and commissures on their outer surfaces. Some of the stems have slender, flexuose shoots with small, green, greatly crisped leaves. Odd as they seem, I can only assume that they are an anomaly resulting from continued growth, perhaps in a plastic bag, before drying.



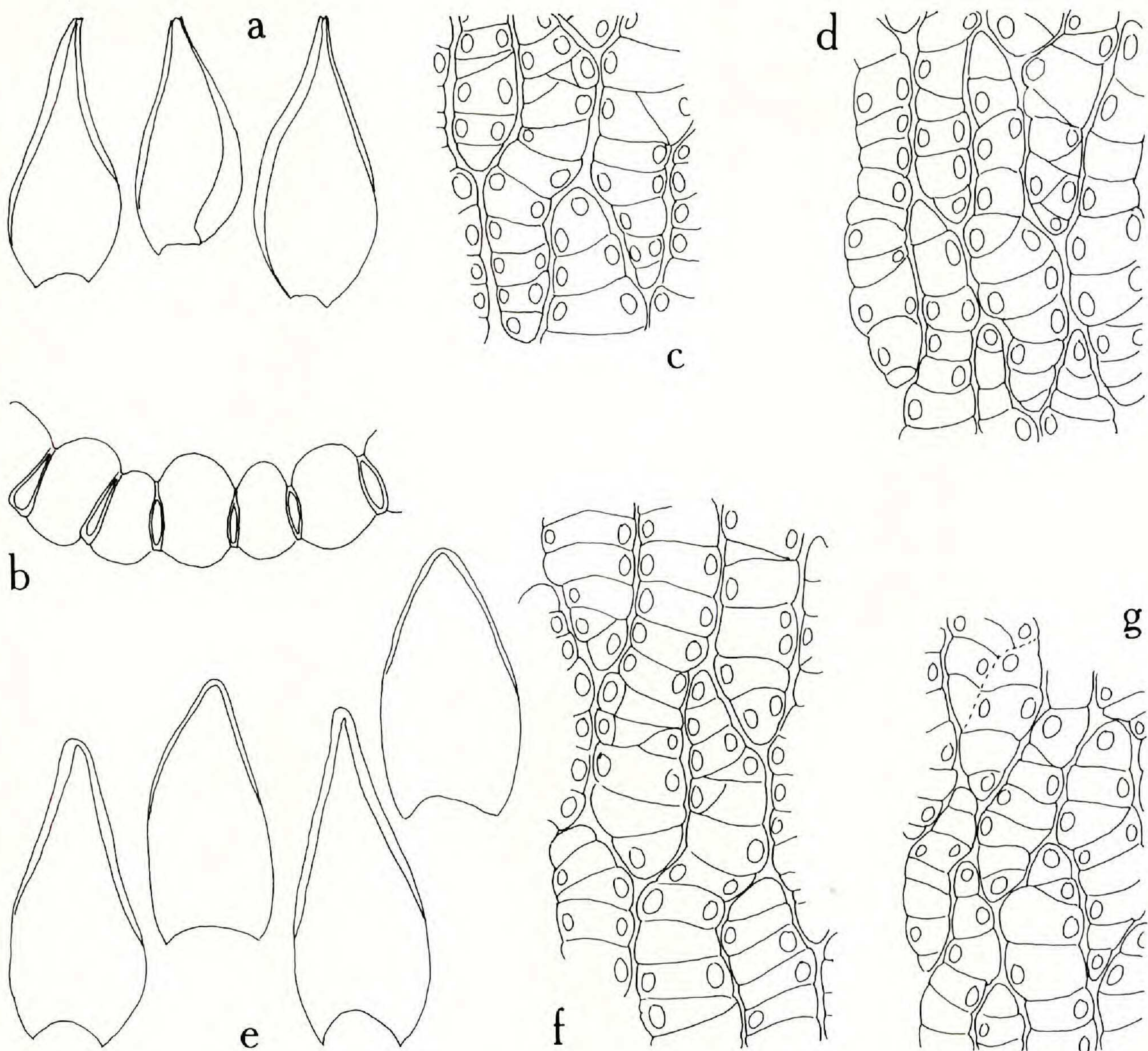


FIG. 6. *Sphagnum exile*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ . e. Stem leaves,  $\times 25$ . f. Upper cells of stem leaf, outer surface,  $\times 400$ . g. Upper cells of stem leaf, inner surface,  $\times 400$ .

***Sphagnum* [sect. *Subsecunda*] *exile* Crum, sp. nov.**

Fig. 6.

Plantae parvae, usque ad 4 cm altae, pallide virides. Hyalodermis caulina uno strato; cylindrus lignosus pallide luteus. Folia caulina 1.2–1.4 mm longa, concava, oblonga vel oblongo-ovata, anguste limbata; cellulae hyalinae raro septatae, plerumque fibrillosae, utrinque poris numerosis, commissuralibus, superficie exteriori saepe in seriebus  $\pm$  continuis sitis. Rami singuli, breves (3–6 mm longi). Folia ramulina 1.1–1.4 mm longa, ovata; cellulae hyalinae utrinque poris commissuralibus numerosis, supra medium foliorum seriebus  $\pm$  continuis; cellulae chlorophylliferae sectione transversali triangulo-trapezoideae vel orciformes, utrinque liberae, pariete exteriori saepe longiore.

Plants small, 3–4 cm high, pale green. Stem cortex in 1 layer; wood cylinder yellowish. Stem leaves 1.2–1.4 mm long, concave, oblong or oblong-ovate, narrowly bordered; hyaline cells not or very rarely divided, fibrillose throughout, with numerous pores on both surfaces, often in nearly continuous rows on the outer. Branches single, short, 3–6 mm long, terete. Branch leaves 1.1–1.4 mm long, concave, ovate; hyaline cells with numerous pores on both surfaces, in  $\pm$



continuous commissural rows in the upper 1/4 or more; green cells in section triangular-trapezoidal, narrowly exposed on the inner surface, more broadly exposed on the outer, sometimes  $\pm$  orciform and equally exposed on both surfaces.

BRAZIL. Minas Gerais: Km 58 an der Strasse BR-135 zwischen Jusselino Kubitschek und Diamantina, Serra do Espinhaço, 1100 m, *J.-P. Frahm 1841*, 29 July 1977 (holotype MICH; isotype, ALTA).

The species is nicely characterized by its small stature and short, terete, single branches, as well as similar stem and branch leaves with pores numerous on both surfaces and often in continuous commissural rows toward the leaf tips.

**Sphagnum** [sect. *Subsecunda*] **laxulum** Crum, sp. nov.

Fig. 7.

Plantae molles, pallidae fuscae, usque ad 9 cm altae. Caulis pallidus, gracilis; hyalodermis strato uno. Caules et rami laxe foliati, apice in fasciculum dense aggregati. Folia caulina 3 mm longa,  $\pm$  concava, lingulata, apice rotundata, plerumque anguste limbata; cellulae hyalinae raro 1-septatae, prope ad basin fibrillosae, superficie exteriori poris parvis, in seriebus continuis commissuralibus, interiore poris 1–3 ad angulas et commissuras dispositis. Rami singuli, 15–30 mm longi, laxe dispositi. Folia ramulina 1–2.5 mm longa, concava, late oblongo-ovata; cellulae hyalinae poris ut in foliis caulium; cellulae chlorophylliferae sectione transversali fusiformes, utrinque anguste liberae.

Plants soft, pale brownish, up to 9 cm long. Stems pale, very slender; cortical cells in 1 layer, not porose; wood cylinder brown. Stems and branches loosely foliate, ending in a globose cluster of crowded leaves; capitulum scarcely evident; branches well spaced. Stem and branch leaves similar except in size and concavity. Stem leaves 3 mm long, somewhat concave, lingulate, rounded at the apex, narrowly bordered throughout; hyaline cells not divided (or rarely 1-septate), fibrillose nearly to the leaf base, on the outer surface with many small, rounded-elliptic pores in continuous commissural rows, on the inner surface with 1–3 small pseudopores at angles and commissures. Branches single, 15–30 mm long; retort cells long and narrow, with pores scarcely protruding. Branch leaves 1–2.5 mm long, deeply concave, broadly oblong-ovate; hyaline cells undivided (or rarely 1-septate), on the outer surface with small, rounded-elliptic pores in continuous commissural rows, on the inner surface with 0–2 small pseudopores at angles and commissures; green cells in section narrowly fusiform, somewhat exposed on both surfaces owing to thickened walls, the hyaline cells slightly convex or nearly plane on both surfaces.

BRAZIL. Minas Gerais: an der Strasse MG-55 zwischen Morro do Pilar und São Sebastião, Ufer des Rio Peixe, 650 m, *J.-P. Frahm 1865*, 31 July, 1977 (holotype, MICH; isotype, ALTA).

The plants, with very slender stems and single, well-spaced and loosely foliate branches, give suggestion of an aquatic or perhaps seasonally inundated growth. The hyaline cells of both stems and branches have an abundance of pores on the outer surface and only a few pseudopores on the inner. The retort cells of the branch cortex are very long and narrow.

**Sphagnum** [sect. *Acutifolia*] **laxirameum** Crum, sp. nov.

Fig. 8.

Plantae graciles sed elongatae, usque ad 16 cm altae, pallide virides. Caules pallidi; cellulae epidermidis elongatae, pro parte porosae; cylindrus lignosus  $\pm$  luteus. Folia caulina 2–2.3 mm longa, concava, ovata vel oblongo-ovata, usque ad basin anguste limbata; cellulae hyalinae superne fibrillosae, superficie exteri-



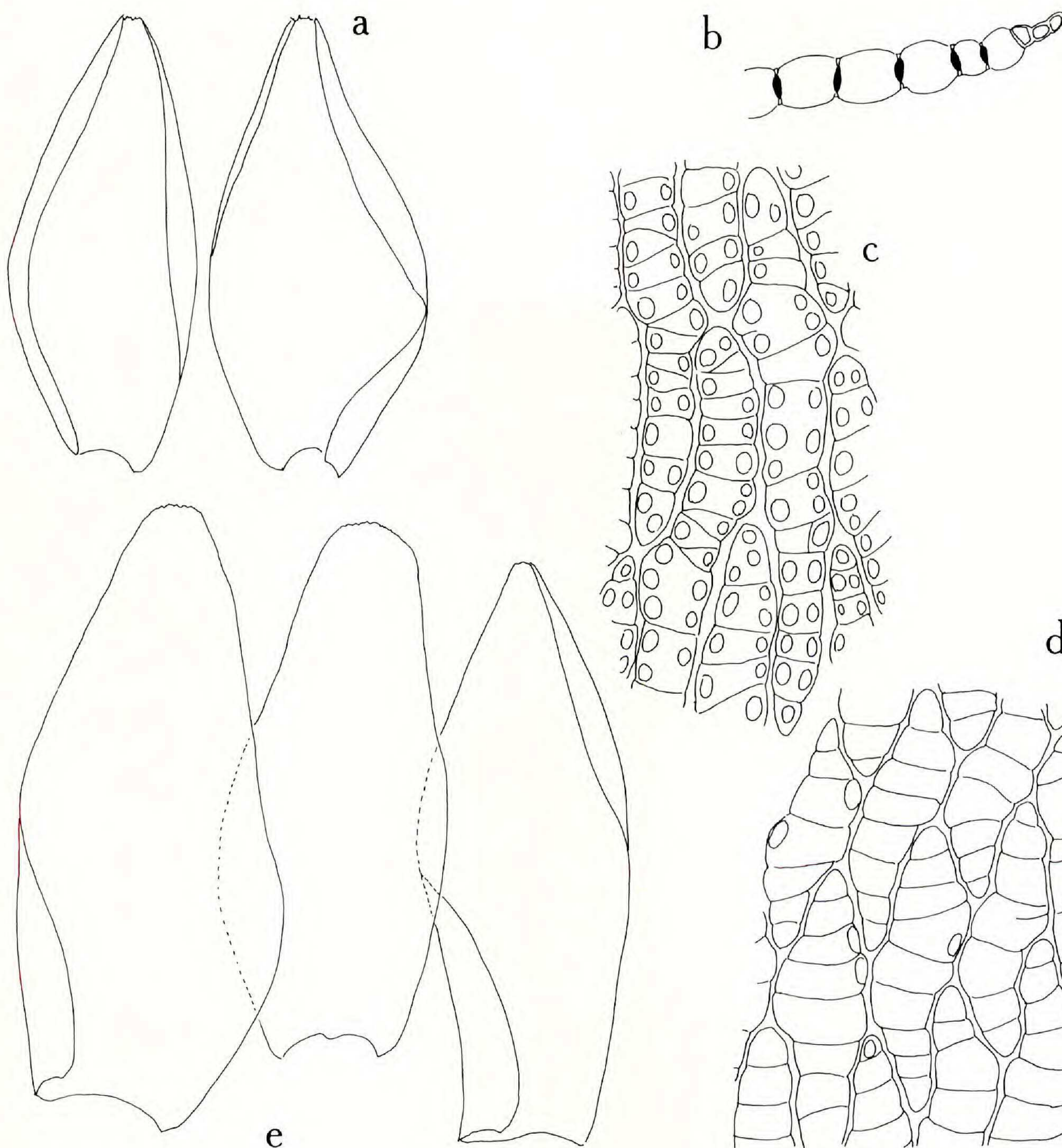


FIG. 7. *Sphagnum laxulum*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf, in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ . e. Stem leaves,  $\times 25$ .

ore poris 1–5 ad angulas et commissuras dispositis, interiore omnino 1–2 lacunis rotundis. Rami 3-fasciculati. Folia ramulina 1.8–2 mm longa, concava, oblongo-ovata, anguste limbata; cellulae hyalinae superficie exteriori poris numerosis commissuralibus, interiore nullis vel paucis; cellulae chlorophylliferae sectione transversali late triangulares, superficie interiore liberae.



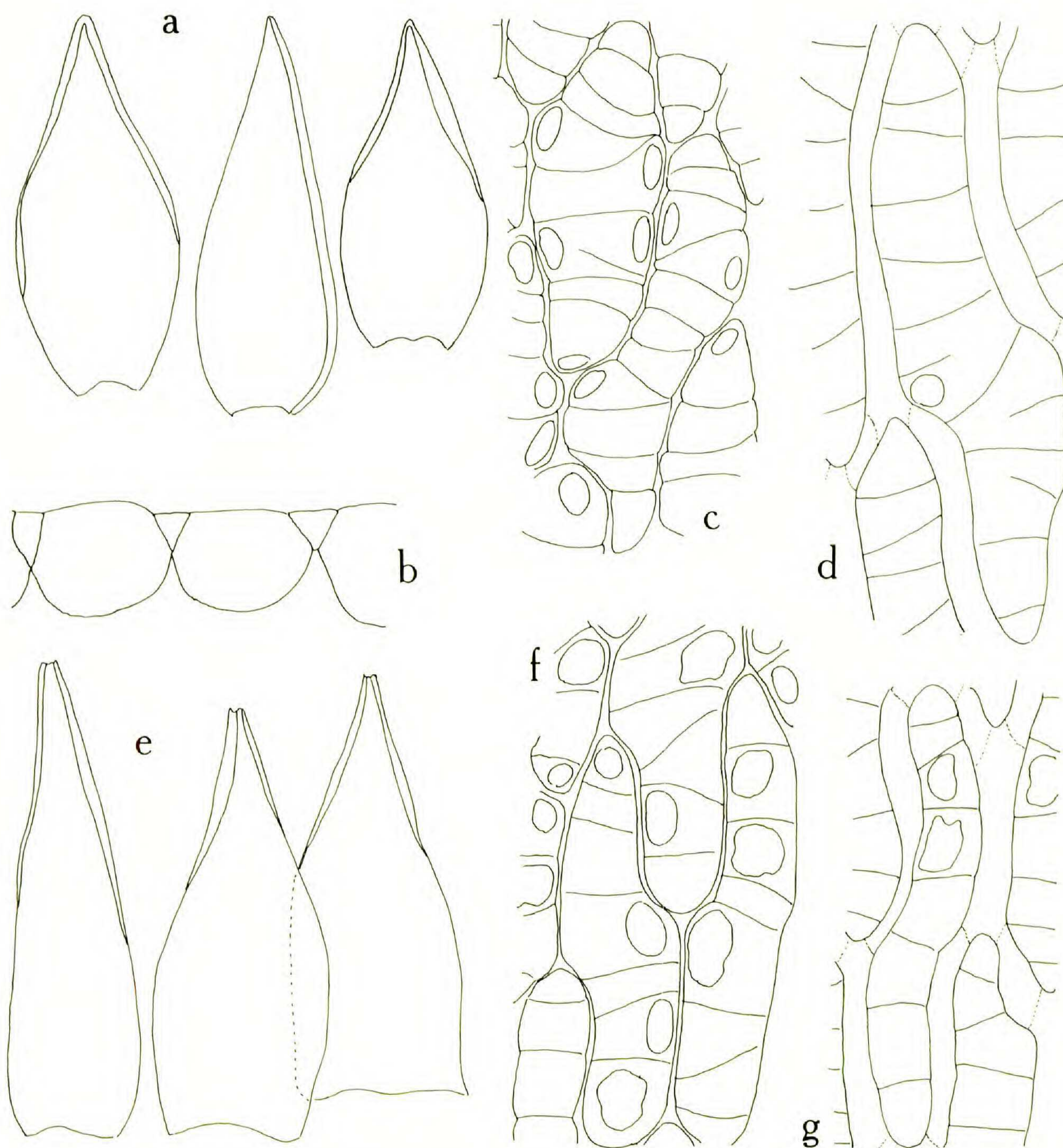


FIG. 8. *Sphagnum laxirameum*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ . e. Stem leaves,  $\times 25$ . f. Upper cells of stem leaf, outer surface,  $\times 400$ . g. Upper cells of stem leaf, inner surface,  $\times 400$ .

Plants slender but elongate, pale-green, ca. 16 cm high, with a small capitulum and well-spaced branch fascicles. Stems pale; cortical cells elongate, some of them porose at their upper ends; wood cylinder yellowish. Stem leaves much like branch leaves in size and shape, 2–2.3 mm long, concave, ovate or oblong-ovate, narrowly bordered, the border not expanded at base; hyaline cells fibrillose in the upper 1/2



or 2/3, mostly 1-divided toward the base, on the outer surface with 1–5 rounded-elliptic, thin-margined pores at commissures and angles, on the inner surface with 1–2 round, porelike gaps, toward the apex in the lower half with rounded gaps of nearly cell width 1–2 per cell or cell compartment. Branches in fascicles of 3 (1 pendent). Branch leaves not ranked, somewhat spreading when dry, concave and often  $\pm$  hooded at the apex, fibrillose to the base, 1.8–2 mm long, broadly oblong-ovate, narrowly bordered; hyaline cells on the outer surface with numerous narrowly elliptic, somewhat ringed commissural pores, on the inner surface with pores none or very few, rounded, and thin-margined; green cells in section broadly triangular, exposed exclusively or more broadly on the inner surface, the hyaline cells somewhat convex on the inner surface, bulging on the outer.

COLOMBIA. Dpto. Cundinamarca: Mpio. Pacho, carretera Zipaquira–Pacho, 5°6'N, 74°6'W, 3050 m, cañada a un lado de la carretera, bosque montano alto, *Edgar Linares & Steven Churchill 3740*, 25 August 1992 (holotype, MICH; isotype, NY).

The slender but rather tall, pale green plants have only a suggestion of a capitulum, and the branch fascicles are laxly arranged. The stem and branch leaves are rather similar and relatively large (1.8–2.3 mm long). The stem leaves are narrowly bordered to the base, with hyaline cells fibrillose and porose in the upper half or more and mostly 1-divided toward the base, on the inner surface with 1–2 broad, rounded gaps (nearly cell width) in each cell or cell compartment. The branch leaves are often cucullate at the narrow apex.

**Sphagnum** [sect. *Acutifolia*] **fraudulentum** Crum, sp. nov.

Fig. 9.

Plantae 5–8 cm altae, roseae vel rufae. Hyalodermis caulis stratis 2–3; cellulae epidermidis superficiei exterioris raro porosae; cylindrus lignosus roseus. Folia caulina 1.6–2 mm longa, concavo-acuminata, basi oblonga, usque ad basin anguste limbata, superne fibrillosa; cellulae hyalinae non septatae, superficiei exterioris superne poris magnis vel lacunis 5–8 ad commissuras et in medio dispositis, interioris poris 0–2, utrinque ad basin 1–3 lacunis rotundis. Rami 3-fasciculati. Folia ramulina laxe patentia, saepe subsecunda, 2 mm longa, concava, ovato-acuminata, usque ad basin fibrillosa; cellulae hyalinae superficiei exterioris poris 5–6, ellipticis, annulatis ad apices et commissuras, ternis in angulis dispositis, interioris poris nullis vel singulis; cellulae chlorophylliferae triangulo-trapezoideae, pariete interioris longiore.

Plants 5–8 cm high, bright red to pink. Stem cortex 2–3-layered, not or rarely porose at the surface; wood cylinder deep pink. Stem leaves 1.6–2 mm long, concave-acuminate from an oblong base, narrowly bordered to the base, fibrillose in the upper 2/3; hyaline cells not divided, on the outer surface in the fibrillose upper portion with 5–8 rounded-elliptic, commissural or median pores or porelike gaps (often nearly as wide as the cell), on the inner surface with 0–2 rounded gaps, toward the base with 2–3 rounded gaps on the outer surface and 1–2 on the inner. Branches 3-fasciculate (2 spreading); retort cells short-necked. Branch leaves loosely spreading and often  $\pm$  secund, 2 mm long, concave, ovate-acuminate, fibrillose to the base; hyaline cells on the outer surface with 5–6 narrowly elliptic, ringed pores at ends and commissures, close-set in 3's at adjacent angles, on the inner surface with pores none or rarely a single small end pore; green cells triangular-trapezoidal, exposed more broadly on the inner surface, the hyaline cells convex on both surfaces, more so on the outer.



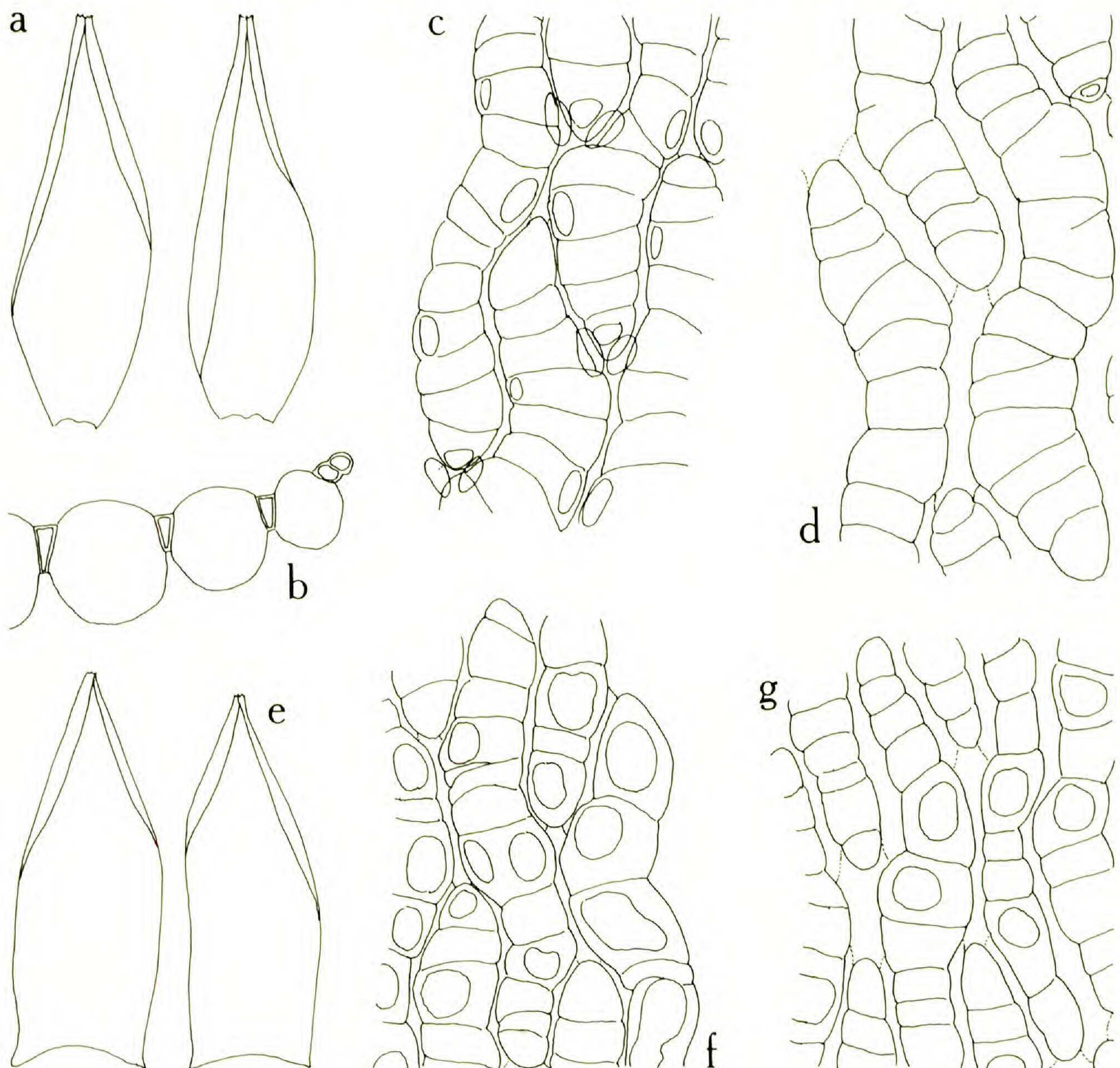


FIG. 9. *Sphagnum fraudulentum*. a. Branch leaves,  $\times 25$ . b. Portion of branch leaf in section,  $\times 400$ . c. Upper cells of branch leaf, outer surface,  $\times 400$ . d. Upper cells of branch leaf, inner surface,  $\times 400$ . e. Stem leaves,  $\times 25$ . f. Upper cells of stem leaf, outer surface,  $\times 400$ . g. Upper cells of stem leaf, inner surface,  $\times 400$ .

VENEZUELA. Amazonas: Dpto. Río Negro, Cerro de la Neblina, NE end of NW plateau, summit camp no. 10, 12.5 km NNW of Pico Phelps, 16.5 km NE of base camp,  $0^{\circ}54'30''$  N,  $66^{\circ}2'30''$  W, 1690 m, *Heliamphora-Neblinaria* savanna with *Euterpe* along drainage streams, William R. Buck 12910, 12–13 February 1985 (holotype, MICH; isotype, NY).

*Sphagnum fraudulentum* is so-named because of hemi-isophyllous stem leaves that are deceptively similar to those of *S. tenerum* Sull. It differs from that species in having loosely foliate branches that are not particularly crowded in the capitulum, spreading branch leaves, and rounded, porelike membrane gaps, mostly median in position, on the outer surface of stem leaves.